

Ser. No. 10/810,923

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Remarks

Claims 1-17, 19-27, 29-31, 33-40 and 42-45 are pending in the application. Claims 1-9, 12-17 and 43 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,720,519 (Lui *et al.*). Claims 10-11, 19-27, 29-31, 33-40, 42 and 44-45 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lui *et al.* ('519) and further in view of U.S. Patent No. 6,621,045 (Lui *et al.*) and U.S. Patent Application Publication No. US 2002/0170891 A1 (Boyle *et al.*). No claims were objected to and no claims were allowed. By the foregoing amendment, claims 1, 19, 31 and 42 are amended. No new matter is presented.

Claim Rejections – 35 U.S.C. §102

Claims 1-9, 12-17 and 43 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,720,519 (Lui *et al.*). Applicants respectfully traverse the rejection.

Lui does not teach diagnostic feedback that is used during drilling. In Lui, alignment of his microfilter can only be performed by the operator of the laser system either prior to, or after a drilling operation. Lui teaches placing a large area CCD camera directly in the light path to perform sub-beam alignment.

The present invention teaches using diagnostic feedback to adjust the laser during a drilling operation. The feedback provides information pertaining to the laser beam's temporal characteristics, alignment, and power output, and these parameters are adjusted while drilling progresses.

Lui teaches a manual beam alignment that is entirely different than what the present invention claims.

Claims 1, 19, 31 and 42 have been amended to clarify this aspect. Applicants respectfully submit that the elements clearly defined in claim 1 are not shown by the Lui reference and that Lui therefore cannot anticipate the present invention.

Claim Rejections – 35 U.S.C. §103

Claims 10-11, 19-27, 29-31, 33-40, 42 and 44-45 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lui *et al.* ('519) and further in view of U.S. Patent No. 6,621,045 (Lui *et al.*) and U.S. Patent Application Publication No. US 2002/0170891 A1 (Boyle *et al.*).

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Applicants respectfully traverse the rejection.

Lui ('045) discloses a system and method of using a prior art vacuum work piece holder in conjunction with a directed gas flow. The import of Lui ('045) balances normal atmospheric pressure present under a flimsy work piece to be drilled against a deflection of the flimsy work piece in the direction of laser beam travel caused by the laser beams impinging on the work piece. Lui ('045) teaches using a negative pressure above the flimsy work piece surface where the laser beams impinge by using a gas flow. The flow of air across the top surface of the flimsy work piece apparently creates a low pressure area that negates the effects of the impinging laser beams and maintains a constant laser focal plane.

The present invention does not require or use the system disclosed in Lui ('045). The present invention teaches the use of an air-tight chamber amply sized to accommodate a large work piece, such as the turbine engine component claimed. The chamber is maintained at a near vacuum if the work piece is to be drilled in air, or purged using helium. The purpose of the part chamber and its internal environment as used in the present invention is not to compensate for deflections in flimsy work pieces that affect laser focus.

Boyle teaches a system of laser machining vias (a through-connection in a multi-layer printed circuit board (PCB) or integrated circuit (IC)) using a single pulsed laser beam and a "cleanroom chamber." The chamber is used to develop insulating, oxide linings for the vias.

The present invention requires no such attention to chemical reactions. Lui ('045) teaches the use of a gas flow to create a reduced pressure in front of the target area of the work piece and Boyle teaches pulsed laser machining of a substrate inside an environmentally controlled chamber. Boyle's use of his cleanroom is for an entirely different purpose.

Nowhere within the Lui ('519) reference is suggested or mentioned feedback provided from a sensor to maintain laser beam alignment while drilling. Lui ('045) does not suggest a large chamber for holding a large work piece to be drilled in a complete, or near vacuum. Boyle does not suggest in his clean room chamber an alternative use for large work pieces and that a near vacuum or helium atmosphere is preferred when drilling metals or ceramics as in the present invention. It would not have been obvious to use the teachings of Lui ('519 and '045) and Boyle to arrive at the present invention considering that Lui and Boyle do not suggest the functions that the present invention performs.

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Accordingly, Applicants submits that claims 2-17, 20-27, 29-31, and 34-40 and 42-45 are in condition for allowance.

Please charge any fees or deficiency or credit any overpayment to our Deposit Account of record.

Respectfully submitted,

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I hereby certify that this correspondence is being facsimile transmitted this 28th day of July, 2006 to the USPTO, at Fax No. 1-577-273-8300.


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